

Reliability Considerations for Advanced Microelectronics

Sammy Kayali
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive, M/S 303-200
Pasadena, CA 91109
Tel. (818) 354-6830
FAX (818) 393-4559
Email: skayali@jpl.nasa.gov

Recent advances in the design and fabrication techniques of microelectronic devices have resulted in tremendous improvements in system functionality, performance and power consumption. These improvements have been fueled by tremendous growth in the semiconductor industry and increasing demand for hand-held and wireless electronic systems. However, these same advances also impact the stability, reliability and fault tolerance of the devices and systems in question. In addition, the increasing dependence of our society on these advanced systems translates to a higher need for assuring the reliability and long life of such systems.

In order to achieve the desired system performance characteristics, device manufacturers have developed a suite of material systems and semiconductor processes which can satisfy the customer needs. As an example, the demand for faster device switching speeds and low power consumption have resulted in the utilization of new metalization systems and dielectric materials. The limits of device processing technology are continually being pushed to the limit by the utilization of new and advanced processing tools and techniques. Establishing the reliability of these new processes and systems is a constant challenge and requires a detailed understanding of the failure mechanisms and the environments of operation.

This presentation will address current technology trends, the impact on component and related system reliability, and current plans for the utilization of advanced components in high reliability systems.